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LIFE AND WRITINGS OF PROFESSOR F. E. L. BEAL.¹

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Plate VI.

ON Saturday, September 30, 1916, Professor Beal was in his usual health and busy all day at his accustomed tasks in the Biological Survey. On the next day, October 1, while at home and working with his flowers, he was fatally stricken with cerebral hemorrhage. All things point to the conclusion that loss of consciousness, if not death itself, was instantaneous. It was a good way to go and the Professor himself had often expressed a wish for such a passing.

He had returned to Washington only a short time before, from a vacation spent in the land of his youth and was especially pleased with the trip. Professor Beal was in the 77th year of a life which began January 9, 1840, at South Groton (now called Ayer), Middlesex County, Massachusetts. Professor Beal's father, J. Foster Beal, at various times was a school teacher, teacher of penmanship, overseer of the poor, foreman of a railroad construction gang and farmer. He died of tuberculosis when his son was about 8 years of age. The career of the boy subsequent to the death of his father, I quote from an incomplete biographical sketch left by Professor Beal. "It became evident," he writes, "that in taking

¹ Professor Beal's given names in full are: Foster Ellenborough Lascelles.

care of my father in his last sickness, my mother had also contracted the disease and could not long survive. Her one thought was to provide for me. For this purpose she took me and visited Nathaniel C. Day of Lunenburg, Mass., who was her cousin once removed. He was a bachelor about 38 years of age and lived upon a farm where he kept a housekeeper and several hired men. He agreed to take care of me until I was of age. My mother left me the very day we arrived at the farm and I never saw her again alive. This was in early October, 1850, and she died the following December. I lived with Mr. Day on this farm for the next fourteen years. He had various housekeepers during the next three or four years but finally secured the services of Miss Harriet L. Gray. After she had worked for him for about a year, they were married. This lady took some interest in me and my tastes. I was a rather shy, quiet boy fond of reading and of nature. The other housekeepers and the hired men all thought this was nonsense. Mrs. Day, however, thought differently and encouraged me to get an education and make as much as possible of myself."

Here you will join me, I am certain, in saying "All honor to Harriet Day." Even that were weak praise for one who recognized the spark of intellectual power in this orphan boy, sheltered and aided it until it became a steady flame, past the danger of smothering or of being totally extinguished in the vitiated atmosphere of rustic indifference. We have Professor Beal's own words that he was "fond of nature" even in his early years. He has told me of some of his earliest memories relating to natural history: of finding a snake swallowing a frog; of watching a downy woodpecker drilling holes in an apple tree; and of being acquainted with all the flowers along the course he took the cattle to and from their pasturage. He loved nature, and when I tell you he was fortunate enough, in these early years to read Gilbert White's "Natural History of Selborne," you will understand he never could have slackened in this affection.

Continuing the account of his life in the Professor's own language (the period now being subsequent to his attaining majority): "During the ten years,¹ that I had been on the farm, I had been so

¹ Up to the time he was of age; it is believed he was formally apprenticed.

kindly treated by Mrs. Day, that having no other, I had come to look upon this as a home. So I remained working upon the farm of which I was now practically the foreman. My love of learning was such that, encouraged by Mrs. Day, I had demanded and obtained the privilege of attending several fall and spring terms at the Academy in Lunenburg, in addition to the regular winter term of the district school. In 1860 I attended the fall term of Lawrence Academy at Groton and was at school there when Abraham Lincoln was elected."

"In the turbulent times that followed his election and the secession of many of the southern states, I was very anxious to enlist in the Federal Army, but Mrs. Day always dissuaded me. After the disaster of our arms at Bull Run, I insisted that it was my duty to go and opposition was withdrawn. I enlisted in Company A of the 36th Massachusetts Regiment, recruited at Fitchburg, and went into camp at Worcester, Mass."

Professor Beal's regiment together with one from Maine was embarked on the transport Merrimac. One of the first entries in his diary¹ shows that his interest in natural history was irrepressible. On September 4, he notes "Last night I observed the phenomenon of the phosphorescence of the ocean." The regiment arrived at Alexandria, Va., September 6, and was transferred to Washington, D. C., the next day. Marching at intervals they reached Frederick, Md., September 18. At this period they could hear the cannon at the Battle of Antietam, and met prisoners and wounded men being taken to Washington. Professor Beal says "It was a ghastly sight. The pale drawn faces and bloody bandages made an impression that time has never effaced. It was a depressing introduction to the grim realities of war." The regiment proceeded to a point near Harper's Ferry where it was incorporated in a brigade and was reviewed by President Lincoln and Generals McClellan and Burnside on October 3. Professor Beal says "Saw all three of these worthies and took notes." After being marched about the country more or less aimlessly, Professor Beal was taken sick with chills and fever at Point of Rocks, Md., October 20. He was left behind and ordered to go to the Con-

¹ Professor Beal kept a diary during his Civil War experience and continuously from Jan. 1, 1864, until the day before his death.

valescents Camp at Harper's Ferry. He did so, and by November 10, after enduring considerable hardships, reached a similar camp at Alexandria, Va. Here the men lived in tents and looked after themselves, so they could hardly be said to be receiving treatment. On December 8, he says "the Doctor put his ear to my breast and then told me to go to the hospital." Nothing came of this order, however, and on December 29, while still in camp he was examined and recommended for a thirty day furlough. The furlough papers were not received until January 12. He left Washington the next day, reached New York and took a boat for New London. On the boat, he says "I took off my clothes for the first time in over four months and went to bed." On February 5, he was discharged from the service of the United States.

An epitome of Professor Beal's soldiering is: that he was subjected to unnecessary exposure, due to the unpreparedness of the nation in military ways, and fell a victim to the same disease that had taken both of his parents and was then discharged for disability. However, as the long subsequent course of his life attests, Professor Beal made a complete recovery.

After his discharge from the Army, the young man returned to life on the farm on which he grew up. He had a financial nest-egg derived from a small legacy from his mother's estate and wages received on the farm during the later years of his apprenticeship, and he now built a greenhouse and attempted to establish a market-gardening business. He was occupied with this and work on the farm from February, 1863, to December, 1865. Entries in his diaries show that study was not neglected during this period, and notes on birds and insects are frequent. It was at this time that he made the observations on the assembling of moths which he published several years afterward. On January 1, 1866, he began working as a gardener for a florist in Fitchburg, a position he held until the end of March, 1867. Evidently, it was at about this time that the idea of going to the Massachusetts Institute of Technology came to him. He visited Boston March 23, probably for a preliminary investigation, but he notes also that he visited the Natural History rooms — undoubtedly those of the Boston Society. From April to September, 1867, he lived with his foster-parents, the Days, at Leominster and prepared for the entrance examination to

the Institute. This he passed on October 5 and class work was begun October 7. At the end of his 1867 diary, he remarks "I have been sitting alone studying all the evening, thinking of the past and trying to look forward into the dark, misty future, and wondering what another year has of joy or sorrow, in store for me; but joy or sorrow it matters little which, a few short years and both will be as naught in the light of a higher and nobler future."

During the summer vacation of 1868, he superintended the outside work of prisoners of the Leominster jail, and at the end of the summer cared for his foster parents, both of whom were sick. Mrs. Day died in December, 1868, a great loss to the young man. Otherwise the school year of 1868-9 was uneventful. In the summer of 1869, he took a leisurely western trip by way of Chicago, Burlington, Iowa, up the Mississippi River to St. Paul, back to Prairie du Chien, Wis., Niagara Falls, N. Y., and home. Besides this, he made two short camping trips, one of them in New Hampshire. The next summer vacation was taken up by several similar outings. From the second year on, throughout his course, Professor Beal was President of his class. He was older than most of his classmates and evidently filled well the rôle of an elder brother. The Massachusetts Institute of Technology was young and when Professor Beal graduated in 1872, he was the oldest living graduate, a distinction which he naturally held the remainder of his life. During his third and fourth years at the Institute, he taught lower classmen, which sufficiently indicates that his record was a good one. The entry in his diary for March 17, 1870, is: "Delivered my first lecture today."

Professor Beal received his degree March 8, 1872, but continued school work until April 29 when he left for the West, his destination being Crete, Nebraska, where he began surveying for the Burlington and Missouri River Railroad, which is now known as the Chicago, Burlington and Quincy. This season in the prairies gave him an opportunity of studying nature under conditions entirely different from those in New England. From a sketch-book he kept at the time (and he was no mean artist), it is evident he was strongly impressed by the presence of antelope and of the abundant remains of the buffalo. This sketch-book contains pictures also of a horsefly, lubber grasshopper, milkweed butterfly, hog-nosed

snake, and other animals. Professor Beal often referred to his experiences on this trip; one reminiscence, in particular I remember, related to nighthawks. The birds immediately availed themselves of the newly-laid rails as perches, upon which, according to their custom, they¹ sat lengthwise. They were so abundant, Professor Beal says, that he was certain there were enough nighthawks immediately along the right-of-way, to make a continuous row of the birds on both tracks clear across the state of Nebraska. The work on the railroad ended in November, and Professor returned to Boston.

The next year was spent in an attempt to establish a Civil Engineering business at Fitchburg; the field was limited however, and Professor began teaching again at the Institute of Technology in October, 1873. He taught there one school year, spent the next vacation in Boston and on camping trips, and proceeded October 5, 1874, to Annapolis, Md., where he had secured a position as Professor of Mathematics in the United States Naval Academy. The position was held only one year, but I imagine that this was not a serious disappointment to the Professor. The system of formal calls demanded by the naval social code, irked him considerably, and it is certain he would not have stayed indefinitely at the Naval Academy. During the spring of 1875 he actively collected natural history specimens around Annapolis, particularly birds, of which he mounted a number. He returned to Boston June 26. The following summer and winter were passed in Boston and Fitchburg and in short excursions in New England.

March 20, 1876, was an important date in Professor Beal's life, as it was then he started for Ames, Iowa, to take a position in the Agricultural College there; where he met the girl he was to marry and where he remained for the next seven years. After the first semester at Ames, he took an Eastern trip of about a month's duration, attending the Centennial Exposition at Philadelphia and visiting in Boston and Fitchburg. On his next visit to the east which began in November, 1876, he was married on his 37th birthday, January 9, 1877, to Mary Louise Barnes,¹ at Cortland, N. Y.

¹ Mrs. Beal was born at Bath, N. Y., July 22, 1844, and was educated in the Elmira Female College, and the Lyons Musical Academy. She has published two books for boys under the titles: "A Misunderstood Hero" and "Boys of Cloverdale." Professor Beal is survived also by a son Kenneth Foster Beal who was born March 20, 1880.

The newly married pair spent their honeymoon in Professor Beal's old haunts in Massachusetts and proceeded to Ames, Iowa, in March, 1877.

Professor Beal went to Ames as professor of civil engineering. On July 23, 1879, he notes, "heard my first class in Natural History" and on July 24, he was elected Professor of Zoölogy and Comparative Anatomy. In his 39th year, therefore, he finally was enabled to take up as a vocation what all his life had been his favorite avocation. The occasion must have been a happy one though possibly tinged with regret for the lost time. There is no doubt that Professor Beal took the course in Civil Engineering at the Institute of Technology chiefly because he did not know that a living could be made in Natural History. However, he was destined to work almost continuously in that field for the next 38 years, longer than most people are able to follow out any one line of endeavor.

During his stay at Ames, Professor Beal worked unceasingly at natural history problems; the long vacation in the midwinter was occupied largely in study of minute forms with the microscope, in research in comparative anatomy, and in collecting and mounting birds and mammals. He wrote numerous articles on the birds of Iowa which were published in Iowa newspapers, and sent a number of short contributions to the *American Naturalist*. It was at this period that his interest in the economic value of birds came to the fore; he examined the contents of birds' stomachs and his accounts of various species always contained some discussion of the food habits. Professor Beal's early studies of Economic Ornithology, thus were strictly contemporaneous with those of Professor S. A. Forbes of Illinois. These two are the founders of the scientific method of studying the economic value of birds. Professor Forbes dealt with the subject in a broad, philosophical way, but soon gave it up, while Professor Beal devoted himself practically for the remainder of his life to piling up detailed evidence, leaving the general principles to become apparent of themselves. In an article published while he was at Ames, Professor Beal gave the famous estimate that the tree sparrows of Iowa annually destroyed 196,000 bushels of weed seeds, which has been quoted hundreds of times, and which apparently will go on forever.

Perhaps, the greatest privilege enjoyed by Professor Beal at

Ames was association with intellectual men interested in the things that he had previously been compelled to study alone. Among these men were Charles E. Bessey, the botanist, Herbert Osborn, the entomologist, A. S. Welch, President and professor of philosophy, W. H. Wynn, Professor of English Literature, J. H. Macomber, Professor of Physics, T. E. Pope, Chemist, and Charles Aldrich, who like himself was interested chiefly in birds. A number of the professors including Professor Beal formed a dining club known as the Lamellibranchophagists. This organization no doubt was modeled after the contemporaneous New York Society called the Ichthyophagists, and Professor Beal was interested in the latter to the extent of sending a shipment of Iowa river mussels for trial at one of the dinners of the club.

During the last year he spent at Ames, 1882-83, Professor Beal gave courses in geology. In September of that year he went to Massachusetts and bought a farm near that on which he had grown up. Returning to Iowa he made all preparations to move the family and they were settled on the farm in December, 1883.

Here he remained for the next eight years, with the exceptions of a stay in Chicago, where he taught mathematics in the Manual Training School from January to June, inclusive, 1886, and in Washington where he held a temporary appointment in the Division of Economic Ornithology and Mammalogy from December 16, 1886, to June 30, 1887. Even when isolated from the intellectual world and occupied with the daily round of duties on his New England farm, Professor Beal did not give up his interest in scientific things. He lectured to the Grange and State Agricultural Association on various scientific subjects, and it is interesting to note, gave an address to the Lunenberg Farmers' Club on 'The Usefulness of Birds.' At this time he still wrote articles on birds for publication in the Iowa Homestead.

Professor Beal's second and permanent term of service in Washington began February 17, 1892, five years after his temporary appointment. Thereafter he worked for the Biological Survey continuously for more than twenty-four years, making a total of about twenty-five years spent in professional pursuit of the science of Economic Ornithology. During his short period of service in 1886-7, Professor Beal spent his time in making digests of answers

to questionnaires on the rice-bird or bobolink and on the English sparrow. He also studied the distribution of the latter species and prepared the range map published in Bulletin 1, 1889. Up to the time of Professor Beal's second appointment, the Biological Survey had not succeeded in finding a man to carry on systematically the examination of bird stomachs. Professor Beal proved to be the best possible choice as he threw himself immediately at the task, and except for intervals spent in field work and in preparing reports, kept steadily at it throughout his career. To what purpose he labored may be judged by the results. The grand total of bird stomachs examined by Professor Beal for the Biological Survey is 37,825, an average of more than 1500 per year. This enormous number includes birds of almost all families, but Professor Beal paid particular attention to the woodpeckers, the Icteridæ, cuckoos, flycatchers, thrushes, and swallows, upon all of which he wrote reports. He made a study also of the mockers, wrens, thrashers, titmice, creepers, nuthatches, and kinglets, but did not report upon them.

Professor Beal performed five pieces of field work for the Biological Survey; he collected material for the reference collections, and studied the feeding habits of birds, particularly nestlings, in Massachusetts, from June 11 to September 14, 1898. From May 22 to September 22, 1901, and from February 16 to October 1, 1903, and April 6 to December 11, 1906, he worked in California. From July 7 to November 25, 1909, he investigated birds in Washington, Oregon, and California. The results of the first three California trips are embodied in two 100-page bulletins on Birds of California in Relation to the Fruit Industry. Professor Beal was sole author of 20 publications of the Biological Survey, one of which — 'The Swallows, a Family of Valuable Native Birds' — has not yet been issued. He collaborated on four other bulletins, treating in a popular way, the economic value of a large number of common birds. His Farmers' Bulletin entitled 'Some Common Birds in Their Relation to Agriculture (F. B. 54, 1897, revised 1904, rewritten as F. B. 630, 1915) has been reprinted more than 50 times and over a million copies distributed. It has had the largest circulation of any Biological Survey publication, and probably indeed of any publication on American Ornithology.

On the basis of his work in Economic Ornithology, Professor Beal must be given a large share of credit for the progress that bird protection has made in the United States, and we have the most advanced laws in existence. He did more than any other man to reveal the basic facts that were needed to convince the so-called "practical" men of the value of bird protection. He often referred to the Audubon Societies as the army, fighting for bird protection, but, he said, we furnish the ammunition.

His non-official publications included ten short articles in the 'American Naturalist,' and 'Forest and Stream,' numerous newspaper articles, mainly in the 'Iowa Homestead' and 'Iowa State Register,' and a few others in 'The Auk,' 'Science,' etc., and most important of all, his paper on "Birds as Conservators of the Forest" in the 'Report of the New York Forest, Fish and Game Commission' for 1902 and 1903.

Professor Beal also diffused knowledge of Economic Ornithology, to a certain extent, by lecturing. He read a paper on the food habits of birds at Carlin Springs, Va., in 1895, before the State Horticultural Society of New Jersey, and the Eastern New York Horticultural Society in 1899, and the California Academy of Sciences in 1901. He gave shorter talks on the same subject at meetings of the Fitchburg Grange, Potomac Valley Ornithological Club, Biological Society of Washington and Cooper Ornithological Club.

Professor Beal's connection with the American Ornithologist's Union dates from 1883 when he was elected an active member. This membership was allowed to lapse, however, and he was re-elected in 1887 and made a fellow in 1901. He attended nine meetings of the Union as follows: 1892 and 1895, Washington; 1896, Cambridge; 1898 and 1902, Washington; 1903, Philadelphia; 1903, San Francisco; and 1910 and 1914, Washington. At the 1898 meeting, he read a paper on "Polygamy among Oscines."

Professor Beal was a member also of the Cooper Ornithological Club, being transferred to the honorary roll in 1910, and of the Biological Society of Washington. He was one of the organizers of the Potomac Valley Ornithological Club (December 22, 1892) of which he was elected vice-president, January 16, 1893. This organization was short-lived, its activities merging into those of

the Biological Society of Washington. Professor Beal, however, never tired of referring to one feature connected with its organization, that being, the perfection of the Constitution and By-Laws of the Club. Frank Hitchcock, then a member of the Biological Survey, later Postmaster General of the United States was on the Committee, and his persistence in pointing out ambiguities of language and dangers of misinterpretation, resulted in giving his fellow committeemen several evenings of stiff work on a document which they, otherwise, probably would have completed at one sitting. All were agreed, however, that the finished product was strictly iron-clad, and a veritable model of its kind.

Professor Beal was a member also at one time of the Iowa Academy of Sciences, and for many years of the Massachusetts State Grange.

Having thus sketched the career of Professor Beal, it remains to appraise it. In estimating the results of his life, we must not forget the early disadvantages: his being orphaned, his struggle for an education, the comparative lack of encouragement, and total absence of advisors qualified to help him choose a career. Yet the ambition and determination were there, and although most things came to him unusually late in life, he patiently forged ahead. Taking his life as a whole, the guiding star was love of nature. It was in him early and the 'Natural History of Selborne' fixed it. Like I know not how many of us, he was also inspired by the writings of Hugh Miller. 'The Testimony of the Rocks,' and 'The Old Red Sandstone,' fired him with a zeal to collect fossils, but the metamorphic rocks about his early home yielded not one. It was not until he went to Iowa, as a teacher, that he saw fossils, and then he found them everywhere. They were in the sidewalks, in the building stones and even the roads were paved with broken crinoids; what a reward it was for his years of waiting! Professor Beal was a florist by profession and by choice; he never gave up working with flowers and he died among them. Hardly one of his diaries but was used to preserve small specimens of plants in which he was interested.

Professor had the enviable experience of spending a day in a field excursion led by Louis Agassiz, and he never ceased to refer to it with the greatest pleasure. He was always an interested

listener to the natural history experience of others, and from the enthusiasm he showed and care he took in conveying information asked for, I have no doubt he was an excellent teacher. Further evidence of this is his assertion that teaching was the hardest work he ever did.

In reviewing Professor Beal's career, an unusual handicap under which he labored must not be forgotten. For the greater part of his life he was subject to serious nose-bleeding and to violent sick-headaches. For many years, at least one day in seven, saw him incapacitated for duty. It is not surprising, therefore, that at times he manifested a tendency toward the blues. This did not interfere, however, with the development of a keen sense of humor. He greatly appreciated a good story and never lacked a better one to cap it.

Despite the presumption that he should have inherited a weak constitution from his parents, and the fact that his vitality was subjected to the severe strains above-noted, physically, Professor Beal was a marvel. Up to his 70th year he was equal to another man in his prime. At that period he took all day tramps with me, leaped over brooks and vaulted fences with ease. Symptoms appearing subsequently, and which probably were the first warnings of *angina pectoris*, together with the advice of doctors, caused him to adopt as a matter of policy, a less strenuous life. Nevertheless, he rendered full service to the Biological Survey, up to the very day of his death, besides overseeing and personally doing much of the work required to keep going a 3-acre flower, truck, and chicken farm. Bodily, he failed a little, and his memory for some things became impaired, but these changes were noted only by those who had known him long. In no sense of the word could he have been called feeble. He was indeed a grand old man and was so recognized by everyone.

Professor Beal held vigorous views and before he adopted the more staid behavior of an elderly man, was prone to express himself freely when occasion arose. He grew really eloquent at such times and often I have felt thrilled at the power of his thought and speech.

Professor was not a religious man but his life was as blameless as if it had been guided by the most perfect religion. I believe I

an absolutely correct in saying that in his relations to other people, Professor Beal was always in the right. That is a great deal to say; it means devotion to — nay it means more — means living the Golden Rule. Yet my calm judgment is that he succeeded in doing just that.

It is unnecessary, therefore, to add that he won the admiration and affection of all who became acquainted with him. Fortunately, his was not a case in which expression of these sentiments was deferred until after death. On his 70th birthday, the staff of the Biological Survey united in congratulating him and in presenting him with a loving cup. Dinners or luncheons were tendered him on all of his recent birthdays, and the occasion of his 75th, January 9, 1915, is thus recorded in his diary. "The boys took me to Harvey's and stuffed me with oysters, and then presented me with a beautiful piece of cut glass."

As noted at the outset, Professor Beal was in his 77th year. In all probability, therefore, death could not have been long deferred. Is it not much better, then, that it came before there was marked impairment either physical or mental? Certainly that is the way it appears to me, and the conviction that all was for the best for him, checks the feeling of sadness, which, after all is selfish in origin. Our nobler impulses prompt us only to high appreciation of his long career so honorable and useful, of a most admirable growing old, and of a passing that was really enviable. Professor Beal lived the life of a man, unafraid, and was fortunate enough to die in the harness. Our memories of him, therefore, can only be of one well and vigorous, alert of mind, a hard worker and a good companion. If all lives were as productive and all natures so open and honest, it would indeed be a better world.

BIBLIOGRAPHY.

Much of Professor Beal's earlier writing was published in newspapers, and is practically lost. In a scrap-book kept by the Professor are clippings of the newspaper articles hereunder listed, exact references to which are lacking. Most of the sketches were published in the Iowa State Register and in an editorial note included

with them, we are informed that they appeared in the Sunday editions of that journal. The Editor further states with reference to the articles: "They are by Professor Beal of the chair of Zoology in the State Agricultural College, and we consider them, modest as they are, to have decided merit. No one who has intelligent sympathy with the charming little world of bird life, can begin to read one of the articles without finishing it. . . . Several of our most intelligent and critical readers tell us they are charmed with them and that all the articles . . . have gone into their scrap-books." In a letter to the editor sent from Webster City, Iowa, probably by Charles Aldrich, is high praise of Professor Beal's writing. "He is master of a bright, lively, piquant style of writing and is never dull and prosy. He reminds us of Dr. Elliott Coues, and that is praise enough to award any writer on birds."

Following is a short extract from one of the sketches to illustrate Professor Beal's style. The subject — The Catbird — is one that inspired Coues also to some of his finest passages.

"There is nothing, unless it be the ubiquitous birch, more closely associated with school days in the recollections of the New England country boy, than the catbird. He always declares that he *hates* a catbird, but there are few of his surroundings with which he would more unwillingly part. The fun of stoning one of these birds is a joy not to be lightly given up and the best part of it is the bird seems to enjoy it as well as the boy, and it is certain that there results no harm to the former while the latter has all the fatigue. Down in the elder thicket by the brookside, when the boy goes to cut a stick of elder to make a pop-gun with which to enliven the dreary hours of school, the catbird meets him and taunts him with a long drawn m-i-a-u. Fired with rage at this insult he hurls stone after stone with no other effect than to put himself in a heat and waste his hour of nooning, till at last he is late to school, for which he is punished; then, while attempting to make his pop-gun during school time, he is detected, his elder and his dearly beloved jack-knife both confiscated, and he sent in disgrace to sit among the girls for the rest of the afternoon; and all because of that catbird upon whom he vows revenge."

Probably most of the articles were printed during 1876-1883 inclusive, the period of Professor Beal's residence in Iowa, but in

his diaries I find mention of articles being sent to the Iowa State Register as late as 1893. It is practically certain that a number of newspaper contributions by Professor Beal are entirely buried. For instance his diaries mention articles being sent to the Guide and the Tribune about which nothing further is known.

Most of the known sketches appeared in the Iowa State Register; these are listed below in the order in which they are arranged in Professor Beal's scrap-book.

From the Iowa State Register.

The House Wren (*Troglodites aedon*).

Description of habits, especially as to choice of nesting site and amount and kind of food consumed.

The Swallows.

General and food habits of 4 species.

The Woodpeckers.

Use of their nest cavities by other birds; general notes on habits and food.

The Sparrows.

General remarks on composition and habits of group; destruction of weed seeds.

The Nuthatch and His Friends.

General notes on the White-breasted Nuthatch, Chickadee, Brown Creeper, Downy Woodpecker, and Ruby-crowned Kinglet; value of their services in destroying insects.

The Blue Jay (*Cyanurus cristatus*).

General discussion of habits opposing the popular opinion prejudicial to the bird.

The Baltimore Oriole (*Icterus Baltimore*).

Comment on colors, nest, and food habits.

Iowa Birds. The Purple Grackle (*Quiscalus purpureus*).

Habits and economic value.

Iowa Birds. The Catbird (*Mimus carolinensis*).

General habits and summary of food.

Birds of Iowa. The Shrike or Butcher Bird. (*Lanius borealis*).

General habits and food.

Secrets of Bird Life. The Robin (*Zurdus migratorius*). [sic.]

General habits and food.

The Birds of Iowa. The Bluebird (*Sialia sialis*).

General habits and food.

The Birds of Iowa. The Fly Catcher.

The habits and economic value of the Kingbird and Phœbe.

The Birds of Iowa. The Bobolink (*Dolichonyx oryzivorzs*).

A vivid account of the birds habits, with remarks upon food.

The Birds of Iowa. The Meadow Lark (*Sturnella magna*).
General habits and food.

The Birds of Iowa. The Swifts (*Choetura pelascgia*).
Habits; only general remarks on food.

The Birds of Iowa. The Little Screech Owl (*Scops asio*).
Description of notes, the color phases, food habits, comment on a captive.

The Birds of Iowa. The Horned Lark.
Notes on habits and value as destroyers of weed seeds.

Rose-breasted Grosbeak. (*Goniaphea ludoviciana*).
Description of plumage, habits, and particularly of relations to potato beetles.

The Birds of Iowa. Brown Thrush (*Harporynchus rufus*).
Song, habits, and food.

Game-shooting in Iowa. A suggestion as to the farmers and gentlemen sportsmen.

Suggestions for curing trespass abuses.

Our Iowa Winter Birds.

A general account of the winter avifauna; notes on food habits.

The Birds of Iowa. The Crow (*Corvus frugivorus*).

General and unfavorable account of the habits.

Place of Publication Unknown, Probably the Register.

The English Sparrow.

Unfavorable account.

Usefulness of the Seed-eating Birds.

Fringillidæ and Horned Lark.

From the Iowa Homestead.

The Marsh Wren.

Notes on the false nests, and song.

A Chapter on Snakes.

A popular account of the structure and habits.

About Bats.

Structure contrasted with that of birds; habits.

From the Chicago Herald.

How Farmers Should Treat the Birds.

Protect them, furnish nesting sites, and nest boxes.

Prof. Beal's other publications follow in chronological order.

"Assembling" among Moths. *Am. Nat.* 8, No. 4, April, 1874, pp. 234-236.

Males of Prometheus moth attracted to vicinity of female cocoon.

(Report of the Professor of Civil Engineering) 7th Biennial Rep. Board of Trustees, Iowa Agr. Coll. (1876-7), 1877, pp. 90-93.

Limited Appropriations Needed from the State. By Budd, J. L. and

Beal, F. E. L. 7th Biennial Rep. Board of Trustees, Iowa Agr. Coll. (1876-7), 1877, pp. 121-125.

Relates to roads, garden, and sewer.

Birds' Nests in Unusual Places. *Forest & Stream* 10, No. 7, March 21, 1878, p. 118.

Robin's nest on ground.

Our Most Useful Birds. *Trans. Iowa State Hort. Soc.* 1878, pp. 350-355, 1879.

This article contains the original estimate of the quantity of weed seeds destroyed by winter birds in Iowa: 196,537 bushels. In various forms this statement still has constant currency in the press.

Report of the School of Biology. By Bessey, C. E. and Beal, F. E. L. 8th Biennial Rep. Board of Trustees, Iowa Agr. Coll. (1878-9), 1879, pp. 188-190.

Report of the School of Civil Engineering. 8th Biennial Rep. Board of Trustees, Iowa Agr. Coll. (1878-9), 1879, pp. 195-6.

Sandie. *The College Quarterly, Iowa Agr. Coll., Ames*, 2, No. 2, July, 1879, pp. 45-47.

Account of a tame sandhill crane; notes on food.

The Northern Waxwing in Iowa. *Forest & Stream* 13, No. 22, Jan. 1, 1880, p. 947.

Occurrence at Ames, Nov., 1879.

The Potato Bug Bird Again. *Forest & Stream* 13, No. 25, Jan. 22, 1880, p. 1005.

Rose-breasted Grosbeak eating potato beetles.

Greenhouses. *The College Quarterly, Iowa Agr. Coll., Ames*, 3, No. 2, July, 1880, pp. 32-33.

Tardigrades and Eggs. *Am. Nat.* 14, No. 8, Aug., 1880, pp. 593-594, 3 figs.

Eggs laid in shed skin.

Report of the Department of Civil Engineering. 9th Biennial Rep. Board of Trustees, Iowa Agr. Coll. (1880-81), 1881, pp. 45-46.

Report of the Department of Zoology. 9th Biennial Rep. Board of Trustees, Iowa Agr. Coll. (1880-81), 1881, pp. 47-48.

"During the past year one young lady student had made a special study of birds, in relation to their food habits, and has ascertained some important facts," p. 48.

This young lady was Miss M. J. Crossmun, the results of whose studies were published in an article entitled "Food of Birds" in *Trans. Iowa State Hort. Soc.* for 1881 (1882), pp. 264-276. A brief introduction is by Professor Beal. Data obtained from stomach examination are given for the Bluejay, Cuckoo, Baltimore Oriole, Kingbird, Robin, Catbird, Brown Thrasher, White-throated Sparrow, and Crow Blackbird. In the last instance the information based on 44 stomach analyses is presented in considerable detail.

Migrations of the Sand-hill Crane. *Am. Nat.* XV, No. 2, Feb., 1881, pp. 141-142.

Drifting backward before wind.

A Shower of *Cyclops quadricornis*. *Am. Nat.* XV, No. 9, Sept., 1881, pp. 736-737.

A "blood rain" in Henry County, Iowa.

Does the Crow Blackbird eat Crayfish? *Am. Nat.* XV, No. 11, Nov., 1881, pp. 904-905.

Gastroliths found in stomachs probably picked up as grinding material.

Ampelis cedrorum as a Sap-sucker. *Bull. Nutt. Orn. Club.*, 7, No. 1, Jan. 1882, p. 54.

Taking sap flowing from broken twigs.

Nesting Habits of the Horned Lark. *Am. Nat.* 16, No. 3, March, 1882, pp. 240-241.

In very early spring.

Report of Committee on Ornithology. *Trans. Iowa State Hort. Soc.* for 1882, pp. 289-301, 1883.

An account of the habits and usefulness of the family of woodpeckers in general and of 7 Iowa species in particular.

Twigs Killed by Telephone Wires. *Am. Nat.* 20, No. 9, Sept., 1886, pp. 806-7.

Some Notes on Bird Migrations. *Am. Nat.* 20, No. 9, Sept., 1886, pp. 817-819.

Woodpeckers in Chicago; birds killed at lighted tower.

Food Habits of the Cedar Bird (*Ampelis cedrorum*). *Annual Report, U. S. Dept. of Agr.*, 1892, pp. 197-200.

Report upon the examination of 125 stomachs.

The Crow Blackbirds and Their Food. *Yearbook, U. S. Dept. of Agriculture* 1894, pp. 233-248, fig. 25.

This is the most authoritative account of the food of any species of bird, being based upon the examination of 2,258 stomach contents.

The Food and Tongues of Woodpeckers. *Biological Survey Bulletin* 7, 44 pp. 5 pls., 1895. Preliminary report on the food of woodpeckers (pp. 7-33, 1 pl. frontispiece, figs. 1-4).

Formal reports on the food habits of 7 species of woodpeckers and brief notes upon 3 others are given.

The Meadow Lark and Baltimore Oriole. *Yearbook U. S. Dept. of Agriculture*, 1895, pp. 419-430, figs. 110-111.

The food habits of both species are fully discussed, and the verdict in each case is in favor of the bird.

A Demand for English Names. *Auk*, 12, No. 2, April, 1895, pp. 192-194.

Cites popular use of scientific names, and impracticability of making to order common names.

Busy Bird Architects. The Marsh Wren and his Fondness for Constructing Nests. *Washington, D. C., Evening Star*, July 6, 1895.

The Bluejay and its Food. Yearbook U. S. Dept. of Agriculture 1896, pp. 197-206, figs. 40-42.

This is a complete discussion of the range, habits, and economic value of the bluejay. Details are given as to the insect and vegetable food, and experiments to determine preferences of a captive jay are described.

Food of the European Rook (*Corvus frugilegus*). Science N. S. 3, pp. 918-919, June 26, 1896.

Review of paper by M. Hollrung.

Birds that Injure Grain, Yearbook U. S. Dept. of Agriculture, 1897, pp. 345-354.

Professor Beal discusses the cause of the increase in numbers of the principal grain-eating birds, outlines the damage done, and gives somewhat extended accounts of the food habits of 5 species, particularly in relation to grain. Four other species are briefly mentioned.

Recent Investigations of the Food of European Birds. Auk 14, No. 1, Jan. 1897, pp. 8-14.

Review of John Gilmour's article on rook, starling, and wood-pigeon, M. Hollrung on rook, and comparison of food-habits of rook with those of American crow.

Some Common Birds in their Relation to Agriculture. Farmers' Bulletin 54, 40 pp. 22 figs. May, 1897. Revised edition. 48 pp. 22 figs., March, 1904.

See discussion under Farmers' Bulletin 630, 1915.

Cuckoos and Shrikes in their Relation to Agriculture. Biological Survey Bulletin 9, 26 pp. 1 pl. 1 fig. 1898. The food of cuckoos (pp. 7-14, fig. 1).

After noting briefly the general habits of the Yellow-billed and Black-billed Cuckoos, this bulletin treats their food habits collectively.

Some of the Economic Relations of Birds and their Food. Proc. 24th Ann. Session N. J. State Hort. Soc., Jan., 1899, pp. 104-129.

The Feeding Habits of the Chipping Sparrow and the Winter Food of the Chickadee. Bird-Lore 1, No. 3, June, 1899, pp. 97-98.

Review of 2 papers by Clarence M. Weed.

[Review]. Bird-Lore 1, No. 4, Aug., 1899, pp. 133-4.

Review of an article entitled "Birds" by Annie M. Grant and of "The Birds of Ontario in relation to Agriculture by Chas. W. Nash."

Food of the Bobolink, Blackbirds, and Grackles. Biological Survey Bulletin 13, 77 pp. 1 pl. (map). 6 figs. 1900.

This bulletin contains formal reports on the food habits of the Bobolink, the Cowbird, and 7 species of blackbirds. Tabulations of the principal food items, by months, follow the general account of each species, and diagrams graphically conveying the same information are given for the Bobolink, Cowbird, and Red-winged Blackbird.

How Birds Affect the Orchard. Yearbook U. S. Dept. of Agriculture, 1900, pp. 291-304, figs. 34-38.

Birds affect orchards directly by stealing fruit, feeding upon buds, flowers, or the inner bark and sap of the trees, and indirectly by destroying mammals and insects injurious to orchards. This article gives brief accounts of the birds most important in these relations.

Remarks on Economic Value of Nighthawks. Educational Leaflet No. 1, Nat. Comm. Audubon Soc., Jan. 1, 1903, pp. [2-4].

The Relation of Birds to Fruit Growing in California. Yearbook U. S. Dept. of Agriculture 1904, pp. 241-254.

Most of this article is devoted to the discussion of the species injurious to fruit, but some of the chief enemies of fruit pests are briefly mentioned.

Birds as Conservators of the Forest. Rep. New York Fish and Game Commission 1902-3 (Nov., 1906), pp. 236-274, 2 figs., 14 colored plates.

A fresh and important discussion of the birds that have especial relation to forests.

Birds of California in Relation to the Fruit Industry. Part I. Biological Survey Bulletin 30, 100 pp. 5 pls. (1 colored), Nov. 11, 1907.

The food habits of 35 species are fully discussed, including the most important species from the tanagers to the thrushes, in systematic order, together with the linnet, or house finch, the worst fruit pest among the birds in the State. The account of this species is based upon the examination of 1,206 stomachs.

The Relations Between Birds and Insects. Yearbook U. S. Dept. of Agriculture, 1908, pp. 343-350.

The principal points made in this paper are that birds are a very important check upon insects and that their true function is not so much to destroy this or that insect pest as it is to lessen the numbers of the insect tribe as a whole.

Birds of California in Relation to the Fruit Industry. Part II. Biological Survey Bulletin 34, 96 pp. 6 colored pls. Aug. 8, 1910.

A continuation of Bulletin 30, dealing with 32 species of birds, in the families Tetraonidae to Fringillidae inclusive. The conclusion is stated that only four species of birds common in California, can be regarded of doubtful utility. These are the house finch, California jay, Steller jay and red-breasted sapsucker.

Food of the Woodpeckers of the United States. Biological Survey Bulletin 37, 64 pp. 6 pls. (5 colored), 3 figs. May 24, 1911.

The accumulation of woodpecker stomachs in the 16 years since the publication of Bulletin 7 enabled Professor Beal to present in Bulletin 37 formal reports on the food habits of 16 species, 9 more than were treated in the preliminary report. Brief notes upon the food of 6 other species also are included; the food of 11 species of woodpeckers which were not even mentioned in Bulletin 7 is discussed.

Our Meadowlarks in Relation to Agriculture. Yearbook U. S. Dept. of Agriculture, 1912, pp. 321-324.

In this treatise the two North American species of meadowlarks are considered together, as their habits and food are practically identical. In

the laboratory 1,514 stomachs were examined, and the birds proved to be mainly insectivorous, with their vegetable food (22.78 per cent) taken mostly in the winter months. The author concludes that the meadowlarks are ordinarily very beneficial, but under certain local conditions, may do appreciable damage, principally to grain.

Some Common Game, Aquatic, and Rapacious Birds in Relation to Man. By W. L. McAtee and F. E. L. Beal. Farmers' Bulletin 497, pp. 30, figs. 14, May 6, 1912.

This bulletin contains brief accounts of the food and economic status of 19 birds of which those on the California Quail and Franklin's Gull were prepared by Professor Beal.

The Nighthawk. Educational Leaflet No. 1 (2nd ed.), Nat. Assoc. Audubon Soc., pp. 1-4, 1 pl., 2 figs., July 1, 1912.

Entirely revised from original edition of 1903.

The Tree Sparrow. Educational Leaflet No. 16, Nat. Assoc. Audubon Soc., 4 pp., 1 pl., 1 fig., July 1, 1912.

Food of Our More Important Flycatchers. Biological Survey Bulletin 44, pp. 67, pls. 5 (4 colored), Sept. 19, 1912.

This is a formal report on the food of 17 species of our flycatchers based upon examination of 3,398 stomachs.

Food of Some Well-known Birds of Forest, Farm, and Garden. By F. E. L. Beal and W. L. McAtee. Farmers' Bulletin 506, pp. 35, figs. 16, September 25, 1912.

The food and economic status of twenty species of birds are briefly discussed. Accounts of the following were prepared by Professor Beal: Arctic Three-toed Woodpecker, American Three-toed Woodpecker, California Woodpecker, Lewis Woodpecker, Red-bellied Woodpecker, Ruby-throated Hummingbird, Anna's Hummingbird, Arkansas Kingbird, Ash-throated Flycatcher, Western Flycatcher, Chipping Sparrow, Junco, White-crowned Sparrow, Southern Butcher-bird, Audubon Warbler, and Ruby-crowned Kinglet.

Fifty Common Birds of Farm and Orchard. By various members of the Biological Survey. Farmers' Bulletin 513, 31 pp., 50 colored figures, 1913.

The separate accounts of birds prepared by Professor Beal are those on the Bluebird, Robin, Russet-backed Thrush, Ruby-crowned Kinglet, Chickadee, White-breasted Nuthatch, Brown Creeper, House Wren, Myrtle Warbler, Loggerhead Shrike, Barn Swallow, Purple Martin, Song Sparrow, Chipping Sparrow, White-crowned Sparrow, Crow Blackbird, Brewer's Blackbird, Bullock's Oriole, Meadowlark, Red-winged Blackbird, Bobolink, Arkansas Kingbird, Kingbird, Flicker, Downy Woodpecker, and Yellow-billed Cuckoo.

Food of the Robins and Bluebirds of the United States. Department Bulletin 171, pp. 31, figs. 2, February 5, 1915.

This bulletin consists of formal reports on the food of our five species of Robins and Bluebirds, of which a total of 2,432 stomachs were examined.

Some Common Birds Useful to the Farmer. Farmers' Bulletin 630, pp. 27, figs. 23, February 13, 1915.

In this bulletin are discussed the food habits of 59 species of birds. The bulletin was prepared to take the place of Farmers' Bulletin 54 originally issued in 1897 which contains summaries of the food habits of 28 species and brief references to the nature of the food of 8 others. The revised edition (1904) contains 40 specific summaries and notes on 14 species. Farmers' Bulletin 630 is the one article on bird food to have if the complete series of bulletins and other publications of the Biological Survey is inaccessible. Many of the food summaries, though brief, are important, being based on the examination of large numbers of stomachs.

Farmers' Bulletin 630 and its forerunners have been reprinted more than 50 times and a total of over a million copies have been distributed.

Food Habits of the Thrushes of the United States. Department Bulletin 280, pp. 23, figs. 2, September 27, 1915.

Bulletin 280 is a formal report on the food of the thrushes, other than the robins and bluebirds, of the United States. There are six species plus subspecies of three and a total of 1,453 stomachs were examined.

The Bird's Impulse to Song. Country Life (London), 39, p. 520, April 22, 1916.

In response to a letter about the singing of birds along the battle line in France. Professor Beal shows that various forms of excitement are apt to inspire song.

Common Birds of Southeastern United States in Relation to Agriculture. By F. E. L. Beal, W. L. McAtee, and E. R. Kalmbach. Farmers' Bulletin 755, 39 spp., 20 figs., Oct. 26, 1916.

The accounts of the food habits of 13 of the 23 species treated were prepared by Professor Beal.

The Swallows, a Family of Valuable Native Birds. Bulletin No. — U. S. Department of Agriculture, 191—.